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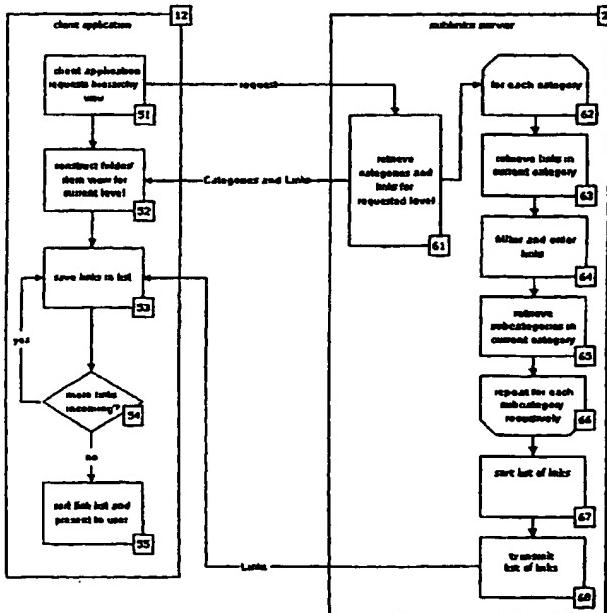
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Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD, SYSTEM, AND COMPUTER READABLE MEDIUM FOR MANAGING RESOURCE LINKS



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(57) Abstract: Resource links also known as Unified Resource Links (URL's), bookmarks, hyperlinks etc. located in a category hierarchy. The resource links are used to navigate on the world wide web, on a local machine, on the internet, or on an intranet. A method of assessing a users competence in a category in the category structure comprising the steps of analysing the users interaction with the resource links placed in the hierarchy table for that category and extracting a competence level for the user in that category.

Method, System, and Computer Readable Medium for Managing Resource Links

This invention relates to finding relevant resources on a
5 large network. This has traditionally been done either by having a program search through the resources and placing indexed resource links in a database, or by having a human editor sort the resources and place resource links to the resources in a category hierarchy. Resource links
10 are links pointing to a resource on the local computer or on a network. These resource links may include hyperlinks or bookmarks to documents on the Internet. A user may then conduct a search within the indexed resource links, and receive a search result based on matches to his
15 search criteria.

The problem with these two approaches will be described below:

Having a program search through a large amount of content on the Internet or an Intranet and place indexed resource
20 links in a searchable database poses some problems. It has proven to be extremely hard to create a program that can locate relevant content.

The main problem is that traditional programs will base the result of a search query on a computerized and
25 stringent set of criteria, which often fall short of the complexity of the real world. It is very hard to set up algorithms for locating and rating the resource links that are relevant for a specific user's search. This is problematic since a very high number of search results
30 are often returned. It is even harder to rate these returned results, based on quality or popularity because no measurement of these properties usually exists.

The problem is particularly evident when searching for content on the Internet, or on a large Intranet. An Intranet is a number of computers connected in a closed network.

- 5 Having a human editor sort through content and sorting resource links to the content into category hierarchy containing several categories and subcategories poses other problems. It is very ineffective to use humans to index information, especially if the network is large,
10 such as the Internet. This is problematic because it relies on the knowledge of the individual sorting the content. There is a fair chance that at least some resource links to content will be indexed or even rated incorrectly.
- 15 Furthermore, the problem with both of these approaches is that neither of the above systems relate the search results to the unique characteristics of the user conducting the search query. This is a problem since two
20 users conducting a search containing the same search string may expect entirely different results, based on what prior knowledge and interests they have.

The known techniques to address these problems are inadequate, and fall far short of the goal. Particularly it has been hard to create a system that only indexes
25 resource links to relevant pieces of content based on the users preferences. Typically a search query may result in thousands of returned results where only a marginal part are truly relevant for the user.

Thus, the problem with finding relevant content on a
30 large network is that a large number of irrelevant results are returned to a search query, and that an editor does not possess the knowledge or the resources to

sort a large number of resource links pointing to relevant content.

Implementing the device described below solves this problem.

- 5 Consequently, this invention relates to indexing content on a large network, rating it by relevance, filtering it, and presenting it to a user.

The invention will be explained more fully below in connection with a preferred embodiment and with reference
10 to the drawing, in which:

fig. 1 shows a computer system with a client computer and a server computer for running a program according to the invention;

fig. 2 shows components on the server computer;

15 fig. 3 shows components on the client computer;

fig. 4 shows a category hierarchy;

fig. 5 shows a flowchart of communicating resource link information between the client and the server;

20 fig. 6 shows a detailed flowchart of filtering and ordering resource links;

fig. 7 shows a flowchart of rating a user's competence within a category; and

fig. 8 shows a detailed flowchart of rating resource links according to usage data.

Fig. 1 shows a computer system with a client computer and a server computer for running a program according to the invention. A client communicates with a server via LAN or WAN. The client consists of a browser (11) and a client 5 (12). The client communicates via a network layer (13) with the server (20) via WAN or LAN. The server consists of a server application (21) that communicates with the client protocol via a network layer (22).

The client application 12 monitors the client file- or 10 web browser 11 activity and registers parameters representative of this activity. These parameters are submitted to the server application 21 via the network layer 13 either automatically or upon a user's command. The parameters can be e.g. the point of time at which a 15 resource link is activated, the type of interaction, the time a connection to the resource was open, a reference to the resource link or the link itself, etc. The type of interaction can be e.g. clicking a link to the resource in a document, typing the URL to the resource in a 20 browser, creating a bookmark to the resource etc.

The activity of the file- or web browser 11 can be monitored by direct interaction with the browsers event and properties system or by monitoring log data stored by the browser, or by monitoring network data traffic.

25 All client applications have a unique identification number. These parameters are submitted to the server application 21 as a packet with the unique identification number appended for the purpose of relating the parameters to a specific client at the server.

30 Fig. 2 shows components on the server computer. The server application 47 requests and updates data via a database application 46. In the database application data is kept in a number of tables: A category table 42; a

resource link table 43; a user table 44; a submit table 45; and a usage table 48.

Information in the form of parameters in packets received from client applications is processed by the server 5 application and stored in different tables. Parameters relating to client interaction with resource links are stored in the usage table 48. If the type of client interaction is creating a bookmark to the resource, the parameters may be stored in the submit table 45.

10 A category hierarchy 41 wherein resource links are ordered exists on the server. This hierarchy comprises a category table 42 and a link table 43. If a resource link submitted by a client exists in the link table 43, the resource link is already associated with a category ID in 15 the category table 42.

□ The category table 42 consists of at least, but not necessarily just the following fields:

○ ID. ID comprises a unique ID associated with the category.

20 ○ Name. Comprises the name of the category

□ The link table 43 consists of at least, but not necessarily just the following fields:

○ ID. ID comprises a unique ID associated with the link.

25 ○ URL (Uniform Resource Locator)

○ Title. The title of the link. This title may be derived from the site that is linked to, or from user-input.

Together 42 and 43 comprise the hierarchy database 41.

- The user table 44 consists of at least, but not necessarily just the following fields:
 - ID. A unique user ID to identify the user.
 - 5 ○ Userinfo, that may, among other things, consist of a name, codeword and demographical data.
- The submit table 45 consists of at least, but not necessarily just the following fields:
 - Link ID, that refers to 43.
 - 10 ○ User ID, that refers to 44
 - Category ID, that refers to 42
 - Timestamp that asses when an item in the submit table has been accessed and for how long.
- The usage table 48 consists of at least, but not necessarily just the following fields
 - 15 ○ Link ID, that refers to 43
 - User ID, that refers to 44
 - Timestamp that asses when an item in the submit table has been accessed and for how long.

20

Fig. 3 shows components on the client computer. Describes the client. The figure describes the client application in fig. A. The client comprises the following parts:

- User Login 31

- Submit favourites 32
- Search 33
- Present hierarchy 34
- Use links 35

5

- Fig. 4 shows a category hierarchy. The category hierarchy is stored in the hierarchy table 41. The hierarchy consists of a number of levels. On each level there are one or more categories. Each category may contain one or 10 more categories and/or items in the form of resource links. In any category, on any given level in the category hierarchy it is possible to view items deriving from that category or any category within it. For instance viewing items in the category 121 on level 0, 15 may include items 124, 125 and 126, but also items 129, 130, 136, 137, 138, 139, 133, 134, 141, and 142. Furthermore, viewing items in the category 123 on level 1, may include items 133 and 134, but also items 138, 139, 141 and 142, but not items 129, 130, 136 or 137.
- 20 The category hierarchy 120 can be viewed and browsed by a user of a client application 12, and viewed items may be presented in a filtered and/or rated list in accordance with claim 1. Filter and rating criteria may be set by the individual users. The individual users may also 25 choose to move certain categories or items to other locations in the hierarchy. However, this may only affect the local presentation of the hierarchy for that user. If a user for instance chooses to do so he may have a level 3 category 135 presented in level 0 by moving it to this 30 level. The category will remain in the same place in the server hierarchy.

Fig. 5 shows a flowchart of communicating resource link information between the client and the server. The client application requests to view a certain category (51) by sending a request to the server application (21). The 5 server application retrieves all resource links and categories placed within the category in question 61, these resource links are filtered, rated and ordered 64, and the process is repeated recursively for each category retrieved 66. After all requested resource links have 10 been retrieved, they are sorted by rating 67 and the sorted list is sent to the client application 68. The client application saves every new incoming link (53), waits until all links have arrived, or the server times out 54 and makes a final sorting before the list is 15 presented to the user 55.

Fig. 6 shows a detailed flowchart of filtering and ordering resource links. The server application reviews every resource link 70, retrieves the category ID of the associated category 71, and a list of usage entries 20 relating to the current item 72. The application then rates the item according to the current rating criteria 73. If the item passes the current filter criteria 74 it is added to the list along with the item rating 75 and processing moves onto the next resource link in the list 25 76. Finally, all links are sorted according to their rating 77.

The current filter criteria may be defined by either the user or by the server, and may also comprise a separate rating and filtering process according to a set of rating 30 criteria different those used previously 73. Thus, it may be possible to prevent resources that share certain characteristics from appearing in a listing.

Fig. 7 shows a flowchart of rating a user's competence within a category (c). Category ID and user ID are retrieved 91 and usage data relating to said users usage of resources in said category (c) is retrieved from the 5 usage table 48. For each of these usage entries $u(n)$ 93 activity parameters are retrieved 94 and the users rating in said category $R(c)$ is adjusted accordingly 95. This is repeated until there are no usage entries for this category and user 96. Finally, the calculated user rating 10 for this category is stored in the user table 44.

The calculation of a users rating in a category $R(c)$, may be based on various formulas;

- $R(c)$ is a linear function where each usage entry $u(n)$ adds a fixed value to $R(c)$
- 15 • $R(c)$ is a linear function where each usage entry $u(n)$ adds a fixed value to $R(c)$, and divided by the total number of usage entries in said category (c).
- $R(c)$ is a logarithmic function, where each usage entry $u(n)$ represents a slightly different change in $R(c)$.
- 20 The rating $R(c)$ may be a floating point number with a minimum value of 1.0 for users with no usage entries within said category, and a higher value for users with more usage entries within said category.

- 25 Fig. 8 shows a detailed flowchart of rating resource links according to usage data. For every line in the usage table 48 relating to the current resource link 80, the application retrieves the user ID for the user that submitted the data, which comprise that usage entry, and 30 a rating $R(c)$ of that user's competence in the current category (c) 82. The current resource link's rating is

then multiplied by $R(c)$ 83 and the process is repeated until there are no more lines in the usage table 48 for that category 84.

5 This results in a rated list of resource links where the highest ranked are those that most high ranked user have accessed. Thus resources that are generally used more by people with higher competence within the current category are rated highest.

10 This rating could be performed in a number of other ways using the accumulated set of activity parameters in the database submitted by all the clients programs installed on machines, from which resources within said category has been accessed:

- The rating could be based solely on the number of 15 usage entries for each resource link. Thus, content accessed the most by all users of the system would be rated highest.
- The rating could be based on usage by a subset of users, who share certain characteristics. These 20 characteristics may include a rating of the user's competence within said category.
- The rating could be based on the timestamp submitted as part of the activity parameters. Thus, content accessed more recently by a larger number of people 25 may be rated highest.
- The rating could be based on a modification date submitted as part of the activity parameters. Thus, content updated more recently may be rated highest.

The invention may be embodied as a computer program or a part of a computer program, which may be loaded into the memory of a computer and executed therefrom. The computer program may be distributed by means of any data storage 5 or data transmission medium. The storage media can be magnetic tape, optical disc, compact disc (CD or CD-ROM), mini-disc, hard disk, floppy disk, ferro-electric memory, electrically erasable programmable read only memory (EEPROM), flash memory, EPROM, read only memory (ROM), 10 static random access memory (SRAM), dynamic random access memory (DRAM), ferromagnetic memory, optical storage, charge coupled devices, smart cards, etc. The transmission medium can be a network, e.g. a local area network (LAN), a wide area network (WAN), or any 15 combination thereof, e.g. the Internet. The network may comprise wire and wire-less communication links. Via the network a software embodiment (i.e. a program) of the invention, or a part thereof, may be distributed by transferring a program via the network.

CLAIMS

-
1. A method of presenting resource links in a category hierarchy to a user comprising presenting all resource links placed within the presented category and all resource links placed within all categories held within the presented category.
 - 5 2. A method according to claim 1, further comprising the step of filtering and/or rating the list
 - 10 3. A method according to claim 2 where the list is a rated list of resource links where the highest ranked are those that most high ranked users have accessed.
 - 15 4. A method according to claim 2 where the rating is based solely on the number of usage entries for each resource link, such that content accessed the most often by all users of the system would be rated highest.
 - 20 5. A method according to claim 2 where the rating is based on usage by a subset of users who share certain characteristics, where these may comprise a rating of the users competence within said category.
 6. A method according to claim 2 where the rating is based on the timestamp submitted as part of the activity parameters, such that content accessed more recently by a larger number of users will be rated highest
 - 25 7. A method according to claim 2 where the rating is based on a modification date submitted as part of the activity parameters, such that content updated more recently will be rated higher.

8. A computer system, having means for executing a program, where the program when executed is to make the computer execute the method according to claims 1-7.
9. A computer readable medium, having a program recorded thereon, where the program when executed is to make the computer execute the method according to claims 1-7.
10. A method assessing a users competence in a category in the category structure comprising the steps of analysing the users interaction with the resource links placed in the hierarchy table for that category and extracting a competence level for the user in that category.
11. A method according to claim 9 further comprising the step of extracting the users competence within said category by assessing how often and for how long the user has interacted with content pointed to by a resource link in said category.
12. A method according to claim 9 further comprising the step of extracting the users competence within said category by assessing when the user has interacted with content pointed to by a resource link in said category.
13. A method according to claim 9 where a group of users are grouped and treated as one user.
- 25 14. A computer system, having means for executing a program, where the program when executed is to make the computer execute the method according to claims 10-13.
- 30 15. A computer readable medium, having a program recorded thereon, where the program when executed is to make the computer execute the method according to claims 10-13.

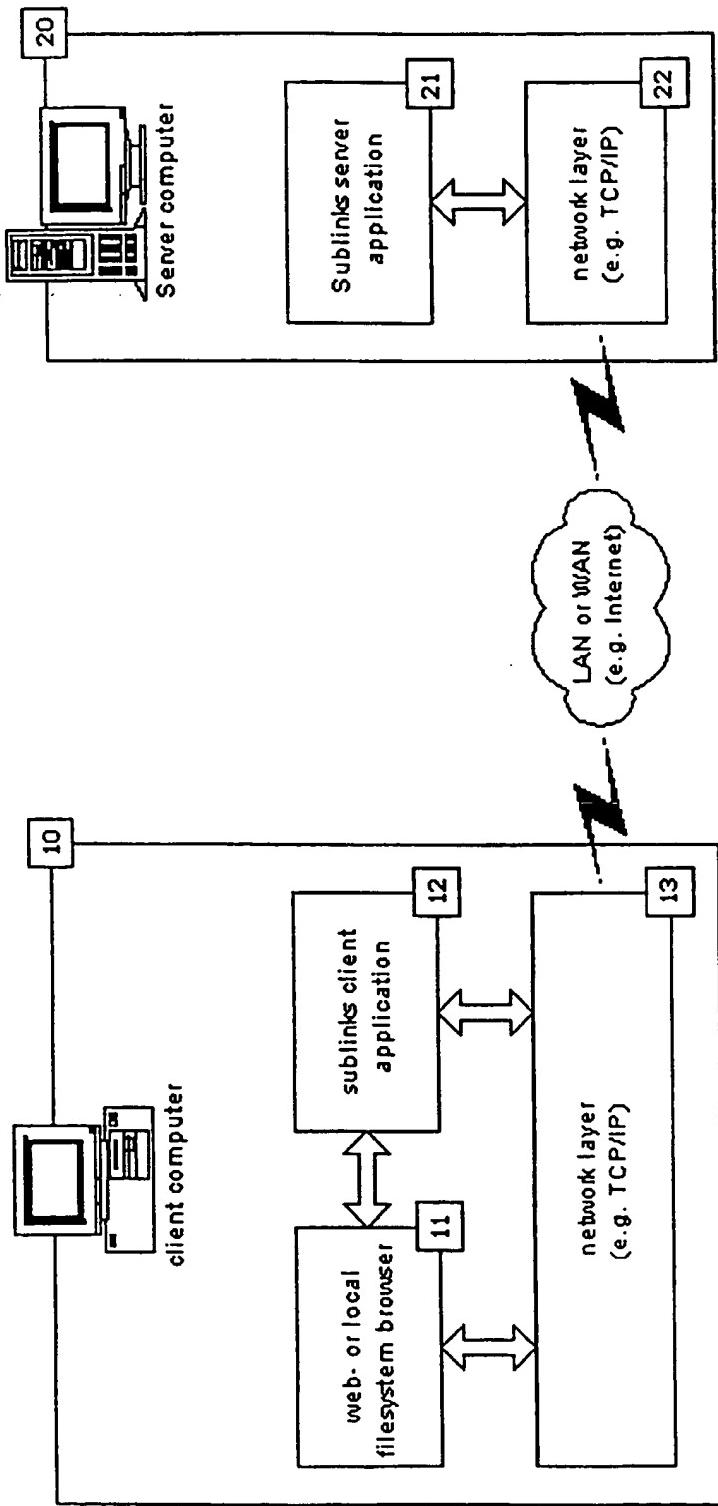


FIG. 1

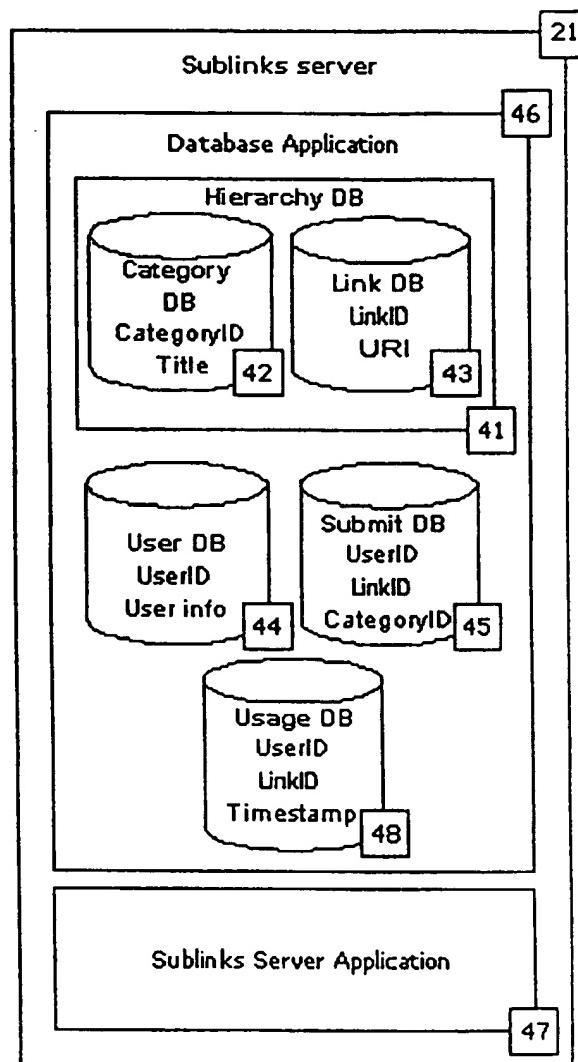


FIG. 2

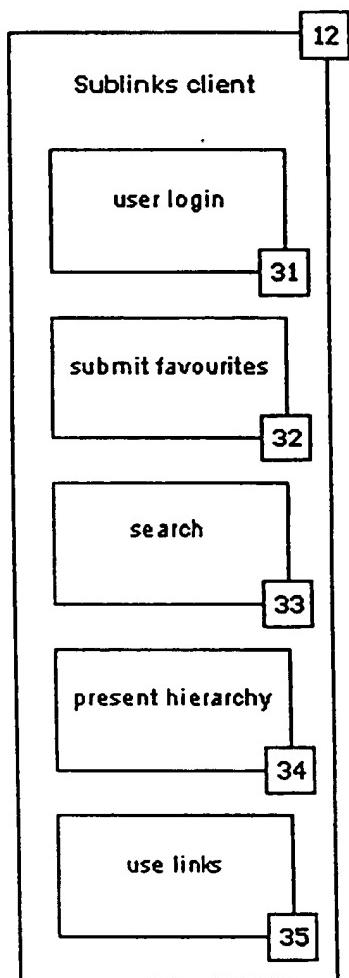


Fig. 3

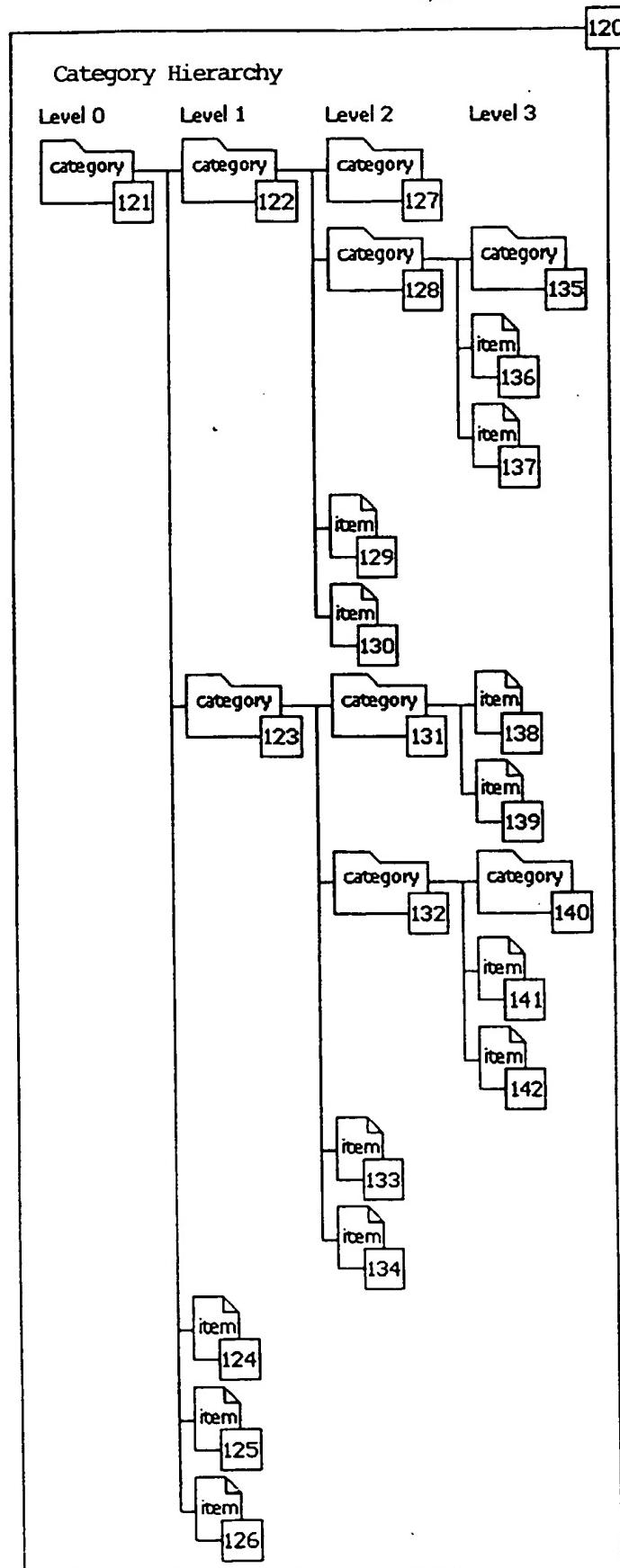


FIG. 4

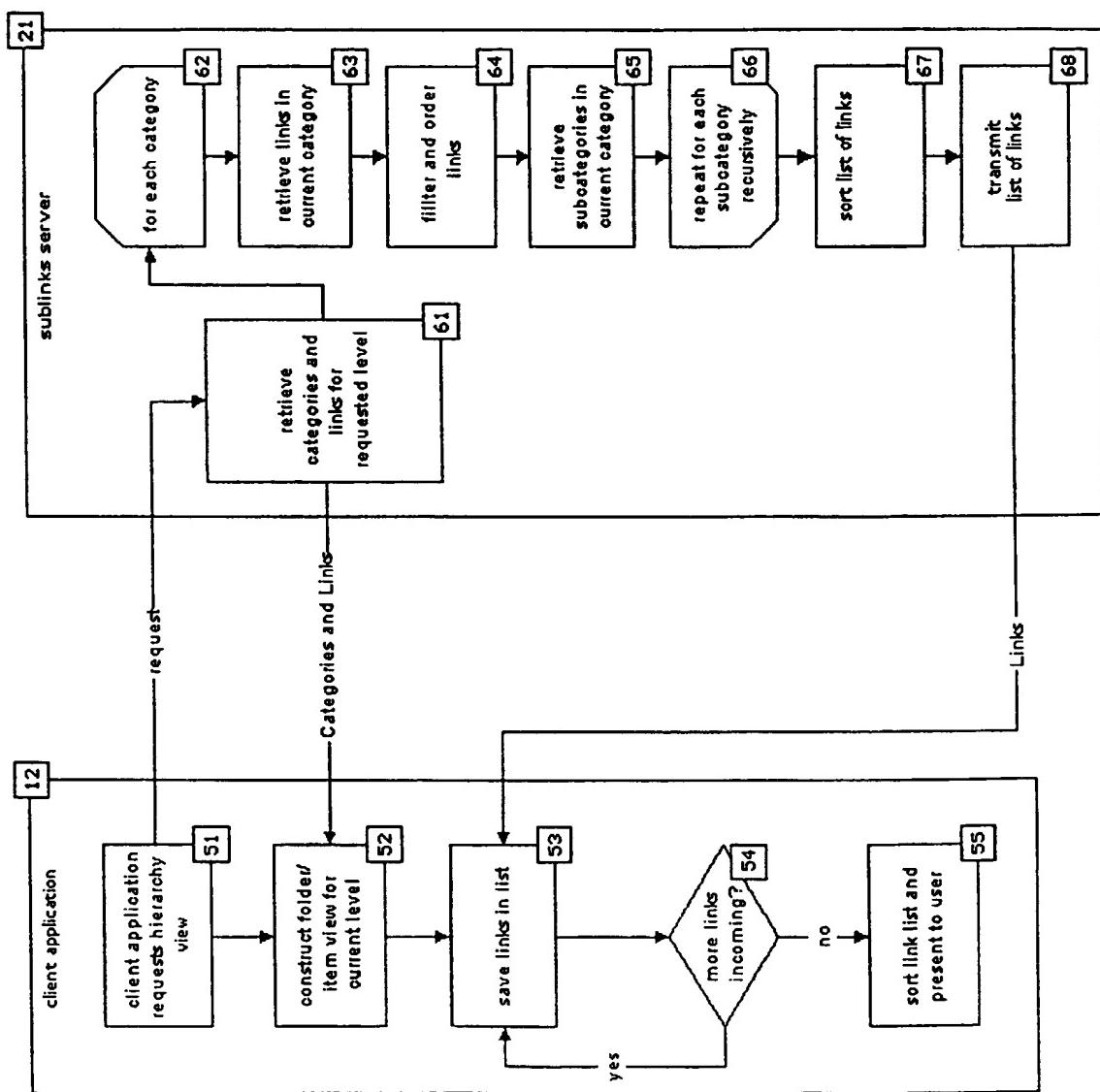


FIG. 5

SUBSTITUTE SHEET (RULE 26)

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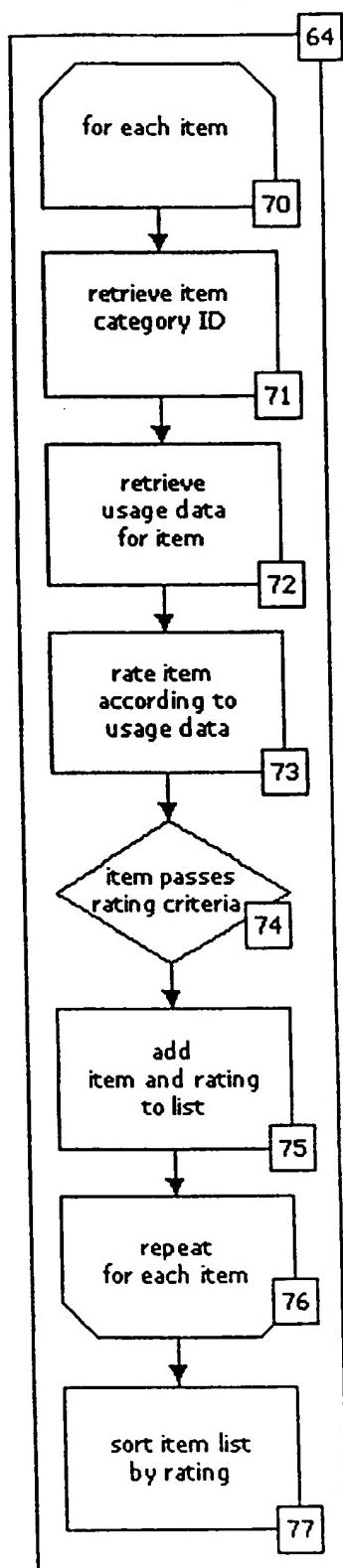


FIG. 6

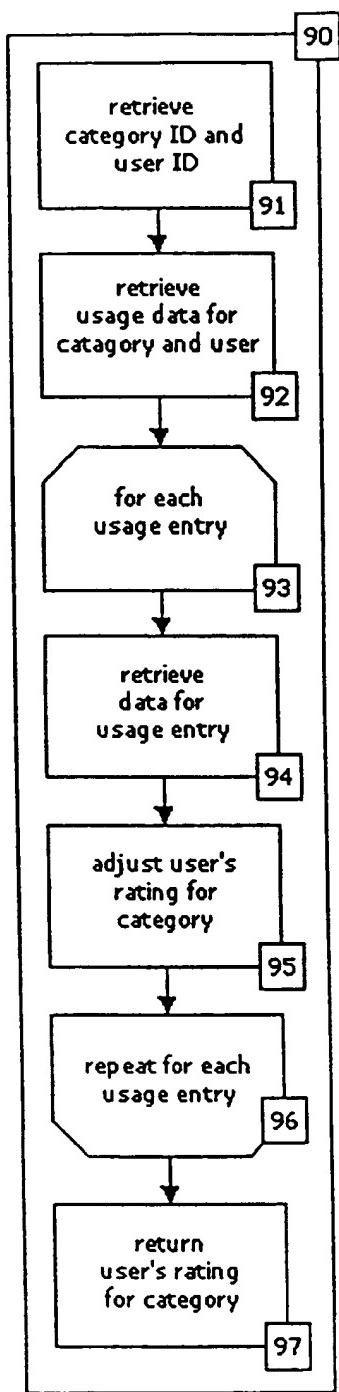


FIG. 7

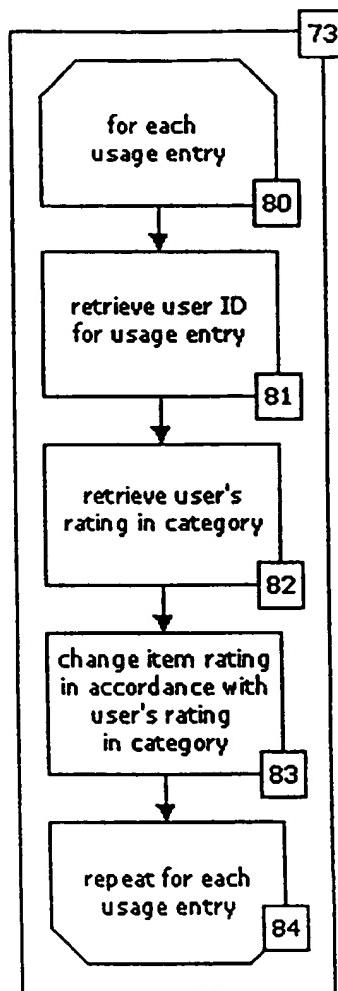


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00614

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 17/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A | US 5917491 A (K.BAUERSFELD), 29 June 1999 (29.06.99), column 8, line 29 - column 9, line 6 -- | 1-15 |
| A | Y.MAAREK ET AL.: Automatically Organizing Bookmarks per Contents.Fifth International World Wide Web Conference, May 6-10, 1996, Paris, France. Retrieved from the Internet: http://www5conf.inria.fr/fich_html/papers/P37/Overview.html Retrieved on: 2001-02-12 -- | 1-15 |
| A | GB 2333617 A (INTERNATIONAL BUSINESS MACHINES CORPORATION), 28 July 1999 (28.07.99), whole document ----- | 1-15 |

 Further documents are listed in the continuation of Box C. See patent family annex.

| | |
|--|--|
| * Special categories of cited documents | "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" document defining the general state of the art which is not considered to be of particular relevance | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
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| "P" document published prior to the international filing date but later than the priority date claimed | |

Date of the actual completion of the international search

Date of mailing of the international search report

13 February 2001

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INTERNATIONAL SEARCH REPORTInternational application No.
PCT/DK00/00614**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
2. Claims Nos.: 1-15 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

What is stated in the claims of the present invention is considered to be a mere presentation of information. However, a report has still been established with the most relevant documents cited.
3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/DK 00/00614

| Patent document cited in search report | Publication date | Patent family member(s) | | Publication date |
|--|------------------|-------------------------|-----------|------------------|
| US 5917491 A | 29/06/99 | NONE | | |
| GB 2333617 A | 28/07/99 | GB | 9825549 D | 00/00/00 |